a physician has to deal, it is his duty to seek the underlying cause of the patient's condition, and direct his treatment to the elimination of that, wherever practicable, rather than to the alleviation of symptoms; many cases of drug addiction owe their origin to professional carelessness in this respect. But where it is not possible to remove the cause, and where its continuance renders necessary or desirable, in the practitioner's honest judgment, the use of morphine, or other narcotic, he need not fear getting into legal difficulties by continuing its use, even though the patient be an addict. In fact, it is highly desirable that patients of this class be freely treated by reputable physicians, rather than be compelled to rely on questionable sources for the relief to which they are rightfully entitled."

OCCURRENCE OF MALARIA AND ANOPHELINE MOSQUITOES IN NORTHERN CALIFORNIA.

By WILLIAM B. HERMS, Associate Professor of Parasitology, University of California, and Consulting Entomologist of the California State Board of Health.

California has made remarkable strides in the control of malaria during the past 10 years, having reduced the p evalence of this disease by at least 60 per cent. This is not only the result of organized effort here and there in the more highly malarial districts, but is even more largely the result of widespread, intelligent individual action. At this rate we are encouraged to believe that the end of the next 10 years will see this State practically free from malaria, despite the increasing difficulties which are due to the multiplication of irrigation projects.

Although malaria has existed in California for at least 70 years, no systematic and concerted community effort in the control of anopheline mosquitoes was undertaken until the summer of 1910, when an antimalaria-mosquito organization was effected at Penryn, Placer County. From this time on, interest in mosquito abatement has grown apace,[1] and the need of a State-wide malaria-mosquito survey has become more apparent as a basic principle in a program for the control of malaria, the danger of which disease was so forcibly presented in 1909 by Dr. Wm. F. Snow,[2] then secretary of the State board of health.

Many incidental collections of mosquitoes have been made in various parts of California during the past score of years by various workers with no attempt, however, to carry out a serious systematic mosquito survey prior to 1916. The tremendous task involved in carrying out a State-wide mosquito survey is only partly measured by the 153,650 square miles of territory included within the boundaries of California—an area equal to the combined land surface of

[1] Herms, W. B., 1910. Antimosquito Organization in California. California State Board of Health Monthly Bulletin, Nov., 1910, pp. 313-317.

[2] Snow, Wm. F., 1909. Malaria the Minotaur of California. California State Board of Health Monthly Bulletin, Dec., 1909, pp. 109-112.

New York, Maine, Ohio, New Hampshire, Vermont, Connecticut, New Jersey, Delaware, and Rhode Island. In addition to this vast area, there must be considered an enormous range in elevation in the inhabited area and widely separated communities with steep mountain ranges between.

Little progress was made until 1916, when, on March 4, the State board of health passed the following resolution, namely: "That the State board of health undertake, in cooperation with the University of California, a survey of malaria and mosquitoes in California, under the direction of Prof. W. B. Herms, assisted by Mr. S. B. Freeborn, provided the funds of the board will permit of the financing of the plan." It was estimated that the expense of the survey for the first summer would be approximately $2,150, including cost of automobile, operation and repairs, hotel expenses, and general equipment, the salaries of the writer and Prof. Freeborn being borne by the University of California.

"The object of the survey [1] was threefold: First, scientific, in that an accurate knowledge of the specific occurrence and distribution of mosquitoes and malaria was desired; second, economic and remedial, in that accurate information relative to the breeding places of the anopheline species was needed in order that definite and practical suggestions for control could be offered; and third, educational, in so far as literature was distributed, lectures were given, conferences were held, and much personal work was done among the ranchers.

"The objectives of the survey defined from the very start the methods which were pursued. The itinerary of each trip was prepared in advance and adhered to very closely. Adult mosquitoes were easily located in their hiding places during the day, commonly under bridges, in culverts, and in outhouses. By the use of cyanide bottles made of shell vials (1 to 1½ inches deep and ¾ inch in diameter) representative collections were made. After collecting the mosquitoes they were at once placed between cotton wadding in small pill boxes, and each box was given a number which corresponded to a number on a map. Breeding places were then located, descriptions were made, and photographs taken in many instances. Usually, this peculiar performance attracted attention and soon one or more persons were being told the object of our work. Health officers and other public officials were frequently taken into the field and given lessons in the recognition of mosquito larvæ, particularly of the anophelines, and were given suggestions for control measures. In nearly all communities resident physicians were consulted relative to the occurrence of malaria in the vicinity, and blood smears were examined wherever available. Public lectures, previously scheduled, were given, usually

[1] Herms, W. B. 1917. A State-wide Malaria-mosquito Survey of California. Jour. Econ. Entomology, Vol. 10, No. 3, pp. 359-370.

illustrated with local material. Perhaps the most noteworthy lecture given during the summer was that at Redding before the State convention of county supervisors. This lecture was well attended and, evidently, well received. Hundreds of copies of the State board of health Special Bulletin No. 9, by the writer, on Malaria and Mosquito Control, were distributed. In most of the seriously infested localities a house-to-house distribution was made."

Motor transportation was used, and a complete equipment was carried. This equipment consisted of maps, including topographic maps, collecting outfits, pill boxes, and vials, microscope, stain, slides, cameras, and personal effects. The work of the first summer (1916) was greatly accelerated by the assistance of four advanced students who furnished their own motor transportation and living expenses, receiving university summer session credit for the work. The summer's work began April 13 and ended August 14, covering a total of 7,036 miles in 31 northern California counties. The highest elevation reached was about 8,000 feet in the Sierra Nevada Mountains. "We had encountered rain, hail, snow, storm, heat, and cold, and were often subjected to dangers and hardships, but we had visited the home of the mosquito and had seen at first hand conditions good and bad as they actually exist." [1]

The itinerary [2] of the first summer's work included, first, the San Francisco Bay region south to Palo Alto, from San Francisco northeast into the Vaca Valley, to Davis and Woodland, thence, northward on both the west and east sides of the Sacramento River and including Sacramento, Yolo, Sutter, Yuba, Glenn, Tehama, and Shasta Counties, continuing northward to Redding, Dunsmuir, Yreka, and Hornbrook, over the Siskiyou Mountains to Ashland, Oreg., thence easterly to Klamath Falls and directly south into California again through Modoc, Lassen, and Plumas Counties, easterly into the State of Nevada (Reno), westerly into Sierra County, Calif., and southerly through Nevada, Placer, and Eldorado Counties. The final trip of the season included the counties bordering the Pacific from Marin County to Del Norte County.

During the summer of 1917 the work of the survey was carried into middle and southern California, interrupted, however, by frequent demands for inspection of military camps in various parts of the State. The summer of 1918 saw the work of the survey held in complete abeyance, both Freeborn and the writer having accepted commissions in the Army in the meantime. A completion of the State survey is contemplated during the summer of 1919.

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[1] Herms, W. B. 1916. Progress report on State-wide mosquito survey. California State Board of Health Monthly Bull., Vol. 12, No. 4, pp. 192–196.

[2] Herms, William B. 1917. A State-wide Malaria-Mosquito Survey of California. Loc. cit., pp. 366–367.

For purposes of convenience in publishing this report, all counties north of and including the following are classed as northern California, namely, San Mateo, Alameda, Contra Costa, Sacramento, and Eldorado—a total of 30.

Although no preference was made in collecting mosquitoes, this report will deal only with the anophelines, and in order to correspond more or less with the accepted faunal areas of the State the following arbitrary grouping of counties has been made:

A. Sacramento Valley counties: Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Yolo, Yuba.

B. Northern mountain counties: Shasta, Siskiyou, Tehama.

C. Sierra counties: Eldorado, Nevada, Placer, Plumas, Sierra.

D. Plateau counties: Lassen, Modoc.

E. Inland coastal valley counties: Contra Costa, Lake, Napa.

F. Coastal counties: Alameda, Del Norte, Humboldt, Marin, Mendocino, San Francisco, San Mateo, Sonoma, Trinity.

TABLE I.—*Number of deaths from malaria, and average annual death rate per 100,000 for northern California for 10 years, 1909–1918, inclusive.*

	Population.[1]			Deaths from malaria.			Malaria death rate per 100,000. (Annual.)		
	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.
Sacramento Valley counties:									
Butte	142,736	168,518	311,254	57	20	77	39.9	11.9	24.7
Colusa	38,886	39,818	78,704	2	0	2	5.1	0	2.5
Glenn	37,098	42,016	79,114	4	5	9	10.8	11.9	11.4
Sacramento	352,423	407,845	760,268	45	15	60	12.5	3.6	7.9
Solano	139,885	148,535	288,420	1	2	3	.7	1.3	1.0
Sutter	31,910	33,030	64,940	5	3	8	15.7	9.1	12.3
Yolo	69,817	70,598	140,415	13	4	17	18.6	5.6	12.1
Yuba	51,080	54,680	105,760	18	7	25	35.2	12.8	23.6
Total	863,835	965,040	1,828,875	145	56	201	16.8	5.8	10.9
Northern mountain counties:									
Shasta	95,680	99,635	195,315	31	34	65	32.4	34.1	33.3
Siskiyou	95,130	99,785	194,915	4	6	10	4.2	6.0	5.1
Tehama	57,265	58,280	115,545	23	5	28	40.1	8.6	24.2
Total	248,075	257,700	505,775	58	45	103	23.4	17.5	20.3
Sierra counties:									
El Dorado	37,460	37,460	74,920	5	8	13	13.3	21.3	17.4
Nevada	74,775	74,775	149,550	3	5	8	4.0	6.7	5.3
Placer	92,685	98,890	191,575	19	3	22	20.5	3.0	11.5
Plumas	26,665	28,178	54,843	1	2	3	3.4	7.1	5.4
Sierra	20,540	20,740	41,280	1	0	1	4.8	0	2.4
Total	252,125	260,043	512,168	29	18	47	11.5	6.9	9.1
Plateau counties:									
Lassen	24,188	24,923	49,111	1	2	3	4.1	8.0	6.1
Modoc	31,638	34,460	66,098	0	1	1	0	2.9	1.5
Total	55,826	59,383	115,209	1	3	4	1.8	5.0	3.5

TABLE I.—*Number of deaths from malaria, and average annual death rate per 100,000 for northern California for 10 years, 1909–1918, inclusive*—Continued.

	Population.[1]			Deaths from malaria.			Malaria death rate per 100,000. (Annual.)		
	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.	1909–1913 inclusive.	1914–1918 inclusive.	1909–1918 inclusive.
Inland coastal valley counties:									
Contra Costa	166,710	201,210	367,920	4	2	6	2.4	1.0	1.6
Lake	27,630	27,630	55,260	0	0	0	0	0	0
Napa	101,050	109,528	210,578	2	1	3	1.9	.9	1.4
Total	295,390	338,368	633,758	6	3	9	2.0	.9	1.4
Coastal counties (exclusive of San Francisco):									
Alameda	1,301,585	1,595,087	2,896,672	15	6	21	1.1	.4	.7
Del Norte	12,090	12,115	24,205	0	0	0	0	0	0
Humboldt	173,415	190,431	363,846	1	1	2	.6	.5	.6
Marin	131,330	155,155	286,485	0	0	0	0	0	0
Mendocino	121,759	130,505	252,264	1	1	2	.8	.7	.8
San Mateo	141,792	178,477	320,269	3	0	3	2.0	0	.9
Sonoma	248,035	273,135	521,170	10	3	13	4.0	1.0	2.5
Trinity	16,505	16,505	33,010	1	1	2	.6	.6	.6
Total	2,146,511	2,551,410	4,697,921	31	12	43	1.4	.5	.9
San Francisco (city and county)	2,129,914	2,317,582	4,447,496	44	16	60	2.7	.7	1.3
Summary:									
Sacramento Valley counties	863,835	965,040	1,828,875	145	56	201	16.8	5.8	10.9
Northern mountain counties	248,075	257,700	505,775	58	45	103	23.4	17.5	20.3
Sierra counties	252,125	260,043	512,168	29	18	47	11.5	6.9	9.1
Plateau counties	55,826	59,383	115,209	1	3	4	1.8	5.0	3.5
Inland coastal counties	295,390	338,368	633,758	6	3	9	2.0	.9	1.4
Coastal (exclusive of San Francisco)	2,146,511	2,551,410	4,697,921	31	12	43	1.4	.5	.9
San Francisco (city and county)	2,129,914	2,317,582	4,447,496	44	16	60	2.7	.7	1.3
Total	5,991,676	6,749,526	12,741,202	314	153	467	5.3	2.2	3.7
Grand total (omitting San Francisco)	3,861,762	4,431,944	8,293,706	270	137	407	7.0	3.1	4.9

[1] The population figures given are the total added populations of each year during the period and are not the actual populations. These figures are used in order to compute more conveniently the annual death rates for the periods which they cover.

TABLE II.—*Occurrence and distribution of anopheline mosquitoes in northern California, based on results of malaria-mosquito survey made in 1916 and 1917.*

	Number of collections made.	Total number mosquitoes of all species collected.	Total number of anophelines.	Total number A. quadrimaculatus.	Total number A. punctipennis.	Total number A. pseudopunctipennis.	Total per cent anophelines.	Total per cent A. quadrimaculatus.	Total per cent A. punctipennis.	Total per cent A. pseudopunctipennis.	Annual malaria death rate per 100,000; average for 10 years.
Sacramento Valley counties:											
Butte	22	168	98	59	24	15	58	60	24	16	24.7
Colusa	25	295	142	128	0	14	48	90	0	10	2.5
Glenn	18	212	123	106	3	14	58	86	2	12	11.4
Sacramento	7	83	60	49	3	8	72	82	5	13	7.9
Solano	7	125	10	1	6	3	8	10	60	30	1.0
Sutter	8	95	80	77	1	2	84	96	1	3	12.3
Yolo	4	58	18	13	1	4	31	72	5	23	12.1
Yuba	6	30	29	27	0	2	97	93	0	7	23.6
Total	97	1,066	560	460	38	62	52.7	82.1	6.8	11.1	10.9
Northern mountain counties:											
Shasta	15	109	67	26	5	36	61	39	7	54	33.3
Siskiyou	8	128	43	42	1	0	34	97	3	0	5.1
Tehama	14	107	58	52	5	1	54	90	8	2	24.2
Total	37	344	168	120	11	37	48.8	71.4	6.6	22.0	20.3
Sierra counties:											
El Dorado	8	50	25	2	18	5	50	8	72	20	17.4
Nevada	11	80	47	2	40	5	59	4	85	11	5.3
Placer	18	127	59	10	35	14	47	17	60	23	11.5
Plumas	4	14	5	5	0	0	36	100	0	0	5.4
Sierra	7	59	3	3	0	0	5	100	0	0	2.4
Total	48	330	139	22	93	24	42.1	15.8	66.9	17.3	9.1
Plateau counties:											
Lassen	10	125	6	6	0	0	5	100	0	0	6.1
Modoc	5	114	22	22	0	0	19	100	0	0	1.5
Total	15	239	28	28	0	0	11.7	100	0	0	3.5
Inland coast valley counties:											
Contra Costa	7	57	2	2	0	0	3	100	0	0	1.6
Lake	3	24	14	8	1	5	58	57	7	36	0
Napa	4	72	21	0	5	16	29	0	24	76	1.4
Total	14	153	37	10	6	21	24.2	27	16	57	1.4
Coastal counties (exclusive of San Francisco):											
Alameda	41	265	4	0	3	1	2	0	75	25	.7
Del Norte	1	1	0	0	0	0	0	0	0	0	0
Humboldt	4	14	3	1	2	0	21	33	67	0	.6
Marin	5	113	15	8	3	4	13	53	20	27	0
Mendocino	9	83	71	8	2	61	85	11	3	86	.8
San Mateo	4	42	6	0	0	6	14	0	0	100	.9
Sonoma	12	110	17	3	0	14	16	18	0	82	2.5
Trinity	2	9	4	1	1	2	44	25	25	50	.6
Total	78	637	120	21	11	88	18.8	17.5	9.1	73.4	.9
Grand total	289	2,769	1,052	661	159	232	38	62.8	15.1	22.1	4.9

Summary and Conclusions.

Of a total of 796 deaths in California due to malaria, reported by the State board of health during the 10 years from 1909 to 1918, inclusive, 467 or 58.7 per cent, occurred in the northern third of the State as indicated above. The average annual mortality rate for the State in these 10 years (population total for the years, 27,127,056) was 2.93 per 100,000, while for the northern third it was 3.7 for the same period, and, exclusive of San Francisco where only imported cases occurred, it was 4.9. No doubt the great majority of the San Francisco cases originated in the territory included in this report, although some San Joaquin Valley cases almost certainly are included, which number would not, however, materially alter the rate in the face of the large population. A marked decrease in the malaria death rate for the State has taken place in this period, namely, from 4.85 per 100,000 in 1909 with a total of 112 deaths to 1.79 in 1918 with a total of 56 deaths, a decrease of 63 per cent in 10 years.

Considering only counties with a high malaria rate, the following show a notable reduction based on five-year periods, comparing the years 1909–1913, inclusive, and 1914–1918, inclusive: Placer County shows a reduction of 85 per cent; Tehama 76 per cent; Sacramento 71 per cent; Butte 70 per cent; Yolo 70 per cent, and Yuba 63 per cent. It is of interest to note that the first organized malaria-mosquito crusades in the State were inaugurated in Placer, Tehama, and Butte Counties.[1] Much of the good accomplished in Sacramento, Yolo, and Yuba Counties is attributable to individual effort under the able leadership of county and city health officers, and farm advisors aided by numerous lectures and conferences on the part of the writer and others. This actually means that there have been about 125 lives saved in that period and no doubt over 50,000 cases of malaria were prevented in these six counties alone during this period of 10 years.

On the other hand, Shasta County has maintained a very high annual rate, namely, 33.3 average for 10 years, with a slight increase during the past few years, and at the present time it occupies the first place in the list of malarial counties. Prior to this, Tehama County occupied first place at 40.1 per 100,000, but now reduced to 8.6, a noteworthy example of what can be accomplished. Eldorado County has been steadily creeping to the top of the list, showing an increase of 60 per cent during the past five years, with a rate of 21.3 per 100,000 for that period. In justice to Shasta County it should be said that a determined stand against malaria has recently been taken and one or more well-organized malaria-mosquito campaigns will be in effect during the summer of 1919.

[1] Herms, W. B., Malaria: Cause and Control. MacMillan Co., N. Y. XI+163 pp. (See pp. 81-138 for description of early work in Placer, Butte, and Tehama Counties.

Unfortunately, little or no effort has been put forth in the direction of malaria control in Eldorado County. In this connection it is perhaps significant to note that no increase of population has been reported in this county during the past 10 years, suggesting that there may be reasons for this backwardness.

For the period 1909–1913, the 10 counties in northern California having the highest malaria rates were Tehama (40.1), Butte (39.9), Yuba (35.2), Shasta (32.4), Placer (20.5), Yolo (18.6), Sutter (15.7), Eldorado (13.3), Sacramento (12.5), and Glenn (10.8). For the following period 1914–1918 there is a decided shifting in position with the order as follows: Shasta (34.1), Eldorado (21.3), Yuba (12.8), Butte (11.9), Glenn (11.9), Sutter (9.1), Tehama (8.6), Lassen (8.0), Plumas (7.1), Nevada (6.7). Owing to the small population of Lassen and Plumas, and the fact that only three deaths from malaria have been reported from these counties, it is hardly fair to include them in the above list, which, if omitted, would place Siskiyou (6.0) and Yolo (5.6) among the upper ten.

Examining this data it will be seen that Tehama has dropped to seventh place, Butte to fourth, Yuba holds its third place, but with a heavy drop in rate, Shasta has risen from fourth to first place, Placer has dropped from fifth to fourteenth, Yolo from sixth to twelfth, Sutter has risen from seventh to sixth, Eldorado has risen from eighth to second place, Sacramento has dropped from ninth to thirteenth, Glenn has risen from tenth to fifth place, and Nevada County has taken its place among the leading ten, occupying tenth place.

More than 50 per cent of all the mosquitoes collected during the survey of northern California were taken in the three divisions (Sacramento Valley, northern mountain, and Sierra counties) where has occurred about 80 per cent of all the malaria, i. e., in 16 out of 30 counties. This is not startling, but when it is known that about 50 per cent of these mosquitoes were anophelines and that 80 per cent of these were *Anopheles quadrimaculatus* and *Anopheles punctipennis*, efficient carriers of malaria, then it is clear that we have the key to the situation—two out of every five mosquitoes captured were at least potential carriers of malaria.

In the Sacramento Valley counties 52.7 per cent of all mosquitoes collected were anopheline, with 82.1 per cent *Anopheles quadrimaculatus* and 6.8 per cent *A. punctipennis*. In the northern mountain counties, practically a continuation of the Sacramento Valley in faunal relation, 48.8 per cent were anopheline, of which 71.4 per cent were *A. quadrimaculatus* and 6.6 per cent *A. punctipennis*. In the Sierra counties 42.1 per cent were anophelines, with *A. punctipennis* the predominant species (66.9 per cent), and *A. quadrimaculatus* second (15.8 per cent). The remaining species of Anopheles

(*A. pseudopunctipennis*) ranged from 11.1 per cent of the total anophelines in the Sacramento Valley to 22 per cent in the northern mountain counties, with 17.3 per cent in the Sierra counties.

Anopheline mosquitoes occurred much less abundantly in the coastal and inland coastal valley counties, 18.8 per cent for the former and 24.2 per cent for the latter, with *A. pseudopunctipennis* the predominant species, i. e., 73 per cent of all anophelines were *A. pseudopunctipennis* in the coastal counties and 57 per cent in the inland coastal valley counties. Malaria is very rare in these counties, Table I showing an average annual rate of 0.9 per 100,000 in the former and 1.4 per 100,000 in the latter. Thus it would appear that *Anopheles pseudopunctipennis* is either a very weak carrier of malaria or is not a carrier at all.

This conclusion is supported by the results of numerous mosquito collections made in every coastal county to the Mexican border.

In this report *Anopheles occidentalis* (Dyar and Knab) has been included with *A. quadrimaculatus*, and for the purposes of this paper is simply regarded as a variety of the latter. It is interesting in this connection to note that in the vast majority of *A. quadrimaculatus* collected in California no differences were detected when compared with eastern specimens, many of which the writer collected during the summer of 1918. It is agreed, however, that specimens corresponding more or less perfectly with the descriptions of *A. occidentalis* have been collected in California, particularly in the coastal counties and here and there in other parts of the State. This is, apparently, a melanotic variety of *A. quadrimaculatus*, a matter with which this report however, has no immediate concern.

ANTIVENEREAL-DISEASE AND SEX-HYGIENE PROGRAM FOR THE COLORED POPULATION.

By Roscoe C. Brown, M. D., Lecturer, United States Public Health Service.

The very significant reports of venereal diseases among the troops during the draft and training periods for army life turned attention to the communities from which the men were called—rural district and village, town and city, the country over. As the result of investigations in civilian communities, it is known that venereal diseases are everywhere prevalent, and that the program which proved successful in combating venereal diseases in war times must be continued and effectively carried out, with special adaptations, for the cleaning up and education of the masses during the period of reconstruction and as long thereafter as the conditions require.

The report of the Surgeon General of the United States Army, 1918, shows a relative venereal disease incidence of 2.8 to 1 of in-